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scales, form of frond, and division of pinnæ. Several times I have found fronds clearly pinnatifid in the lower part. This might be called an extreme form of the variety *Incisum*, and is most likely to occur late in the season, and in rich woods undergoing the process of clearing. The pinnæ are also sometimes once or twice forked at the apex, and there are other changes from the normal form.

Camptosorus rhizophyllus is less variable, but the basal auricles will sometimes be prolonged much like the apex, and will root like that. Specimens have thus been found giving origin to three young plants. I have one frond which is pinnate, but with a normal frond from the same root.

The Osmundas vary much. *O. regalis* has often a few sporangia on the otherwise sterile pinnæ, and *O. Claytoniana* has sometimes the same feature. I have a curious series of *O. cinnamomea*, where the so-called variety *Frondosa* is fertile at the base and apex, at the base alone, at the apex alone, or only in the centre. There are other oddities in this fern.

The Botrychiums vary much. The variations of *B. virginianum* are well known, and the variety *Gracile* is quite persistent in some places. *B. matricariæfolium* varies from age and location, but I have found many distinct and beautiful varieties of *B. ternatum* growing luxuriantly together. In one abundant plantation of *B. simplex* there are many strange forms, not altogether due to age. This is in sphagnum, and not far off I have found it growing in water.

The variation of *Cystopteris fragilis* is a never-failing perplexity to some. It seems so different, and yet so familiar. Often it has been mistaken for *Woodsia obtusa*.

Some ferns which I collected in Colorado were interesting to Professor Underwood from their local variation in a broad sense, being near the limits of their district. I collected *Aspidium septentrionale* on Cheyenne Mountain, but it was immature, yet those of the preceding year were smaller and quite unlike those I had from Europe.

On Skaneateles Lake, N.Y., I found small patches of *Pellaea gracile* growing on wet rocks; in one place, almost in the bed of a small waterfall. In other places there I found it on dry ledges, the roots and tufted fronds forming a dense mat. The station made quite a difference in the appearance.

W. M. BEAUCHAMP.

Baldwinsville, N.Y., April 14.

Singing of Birds.

IN answer to E. B. Titchener's inquiry regarding the relation of song to emotion in birds, the following is offered by one who has made careful observations in the language of over fifty well-known species.

That there is an expression of feeling in the notes of all of our birds no true lover of our feathered friends will attempt to deny. We are all most willing to admit the existence of a bond between them and us, and this relation, or assumption perhaps, we would not care to have dispelled. Nevertheless, although I am so anxious to invest these creatures, "favorites of creation," as Figuer so fondly calls them, with higher attributes of feeling and expression, it remains a fact, that their notes do not change in quality as a result of change in emotion. At least, this is so in so far as our ears are able to distinguish. Let us consider some cases.

A pair of robins will make a great outcry if their nest is molested, the excited notes of the male corresponding exactly to his cries when engaged in his vernal battles, or, later, when giving excited warning to its defenceless young when a marauding cat is at hand. If the eggs are taken, the pair quickly subsides, and the male will probably be singing the same evening; surely the next morning. Within a very few days a new nest is begun in the same neighborhood, the song continuing daily.

I have carefully noted the song of the warbling vireo, which is one of the few birds which sing while sitting upon its eggs. In one instance, after the set of four eggs was removed, the bird remaining near by, and uttering its querulous notes, I waited to observe. The male quickly returned to the empty nest, which it

had recently left, and at once gushed forth in song. It may be that the song expressed much sorrow, or at least a complaint, but to me it was the same inspiring, ecstatic warble that I was accustomed to hear. I have robbed the nest of the scarlet tanager, rose-breasted grosbeak, wood thrush, hermit, and indigo bird, all beautiful singers, and then waited and listened, allowing ample time for the male to learn of the spoliation. In each instance the male quickly tuned up, and, to my idea, sang as sweetly as ever.

The expression of sentiment, or whatever we wish to call it, in the harsh *caw* of the common crow, or the single *cruk* of the raven, may mean as much, and probably does, as the tinkling melody issuing from the elfin winter wren. Then, too, the ever mournful, lonesome song of the wood pewee, or the solemn-sounding *hoo-hoo* of the great-horned owl, or the weird monotony of the whip-poor-will, undoubtedly answer the purpose equally with the sprightly notes of our little friend, the melodious, jingling song-sparrow. However, these notes and songs, although they may mean much to the birds, are, to our obtuse ears, ever the same.

MORRIS GIBBS, M.D.

Kalamazoo, Mich.

On a Supposed Climatic Variation in the Wing-Color of some Orthoptera.

I HAVE read with much interest the communication of Mr. Lawrence Bruner (p. 133) on the supposition that climatic differences may account for the different coloration—yellow, orange, red, blue—of the wings in some North American locusts, and, as the author requests other opinions, I will relate my experience in the Transvaal, where I made a considerable collection of orthoptera in the neighborhood of Pretoria.

Pretoria stands on the high table-land of the Transvaal; an almost treeless region, consisting of vast grassy plains well known by the name of "veld," with occasional hills or ranges of low mountains. In the dry winter season these plains are merely covered with a brown withered herbage; after the summer rains they are clothed with a more or less luxuriant crop of grasses and other plants. Consequently the conditions are very uniform throughout the area, but as I collected in the immediate neighborhood of the town of Pretoria, and during the summer season of 1890-91, the conditions of soil, climate, and altitude were absolutely identical.

My collection of orthoptera made at that time¹ affords evidence against the conclusions of Mr. Bruner, respecting the North American species, as the following list of some of my captures—a few conspicuous species—will show.

Species with orange-colored wings:—

Parga gracilis Burm.

Phymateus leprosus Fabr.

Species with yellow-colored wings:—

Catantops sulphureus Walk.

Oedaleus citrinus Sauss.

Oedaleus tenuicornis Schaur.

Species with red-colored wings:—

Phymateus squarrosus Linn.

Phymateus morbillosus Linn.

Zonocerus elegans Thurb.

Laphronota porosa Stål.

Acridium rubellum Serv.

Species with blue-colored wings:—

Oedaleus acutangulus Stål.

It will be observed that the same genera show different coloration, as *Phymateus*, orange and red; *Oedaleus*, yellow and blue.

The philosophical conception of the origin of these bright colors is very difficult. Of course they are purely non protective, as species thus ornamented are most conspicuous objects when on flight; and even on the ground or elsewhere, where their folded wings and sombre or greenish hues assimilate them to their surroundings, they are easily found and greedily devoured by most birds. I found their remains in the crops of many birds. Even

¹ A complete list is given in the Natural History Appendix to my "Naturalist in the Transvaal."

in the Accipitres, species of *Falco* and *Cerchneis* were found gorged with them; the Secretary bird (*Serpentarius secretarius*) is an orthopteral glutton; bustards, especially the "Gom Paauw" (*Otis kori*) can apparently exist on them alone, while flocks of the common "Spreo" (*Spreo bicolor*) make vast inroads in the immense swarms of the smaller species.

Their survival in the struggle for existence would seem to have been almost entirely dependent on their extraordinary fecundity. Only species with great vitality and immense power of reproduction could withstand the requirements of this mighty avian banquet. The origin of the brightly colored wings cannot, however, be placed to the credit of abundant vitality, as some genera of large and active species exhibit brightly and also sombre and modestly colored wings.

W. L. DISTANT.

Purley, Surrey, England, April 3, 1893.

A Puzzle for Future Archæologists.

NEAR Enon, in Clark County, Ohio, is a well-known artificial mound, commonly called "Prairie Knob," while the level tract on which it is situated is called "Knob Prairie."⁵ A former pupil of mine informed me that when he was a boy his grandfather sunk a shaft in the centre of the mound down to the underlying black soil, without finding any thing of consequence. The old gentleman was disappointed, not to say disgusted, to find this cherished landmark, which he had so long held in high esteem as the supposed receptacle of the regulation quantity of "Indian" relics, so utterly barren. He thereupon determined, in the generosity of his heart, that future explorers should not go unrewarded. He therefore deposited in the hole a miscellaneous collection of stone implements, pottery, shells, old bones, etc., such as he imagined a properly constructed mound ought to contain. This done, he carefully refilled the shaft, and restored the mound to its former appearance.

Imagine the sensation that such a find as this is likely to make when brought to light by some enterprising mound explorer of the twentieth century!

CHARLES B. PALMER.

Columbus, Ohio.

Pre-Historic Remains in America.

NOTWITHSTANDING Dr. Brinton's protest in *Science*, April 14, I think most readers will agree that the language I quoted from his "Races and Peoples" (not "American Race") is clearly open to the incidental criticism offered. That the physical conditions of the American continent have been a potent agency in forming a distinct race, as he explains his language, is readily admitted. I also believe they have moulded the *heterogeneous* elements which peopled the continent from different quarters, at different eras, into a comparatively "homogeneous race," but it is difficult to understand the process of rendering "homogeneous" those already one in race and derivation.

If Dr. Brinton has failed to observe a marked difference between the Atlantic and Pacific types, I presume it is because he has not made the comparison with this thought in view, as it is certainly very apparent. His reference to the few shells and copper articles found in Tennessee and Georgia bearing Mexican and Central American designs is unfortunate for his position. He knows, or ought to know, that these are looked upon by all archæologists as puzzling objects because of their remarkable departure from the types of the Atlantic slope. This fact is, of itself, evidence of the general impression in the minds of archæologists of the differences between the art types of the two regions.

He asks, "Is he [Thomas] not aware that both the Nahuatl and Maya languages trace their affinities exclusively to the eastern and not the western water-shed?" Not claiming to be a linguist, I must present as my reply the words of one who is.

Dr. D. G. Brinton says, in his "Races and Peoples," p. 248: "All the higher civilizations are contained in the Pacific group, the Mexican really belonging to it by *derivation* and *original location*. Between the members of the Pacific and Atlantic groups there was very little communication at any period, the high Sierras walling them apart; but among the members of each Pacific and each Atlantic group the intercourse was constant and

extensive. The Nahuas, for instance, spread down the Pacific from Sonora to the Straits of Panama; the Inca power stretched along the coast for two thousand miles; but neither of these reached into the Atlantic plains." Observe that he says "all the higher civilizations," which, of course, includes the Maya as well as Mexican people. Even in his later work he reiterates this opinion. In speaking of the groups into which he classifies the stocks, he remarks: "This arrangement is not one of convenience only, I attach a certain ethnographic importance to this classification. There is a distinct resemblance between the two Atlantic groups and an equally *distinct contrast between them and the Pacific groups*, extending to temperament, culture, and physical traits" ("American Race," p. 58). Now, when it is remembered that he classes the Mexicans, and, by the above-quoted language, the Mayas also, with the Pacific group, it would seem that, at the date the book referred to was published (1891), he was advocating precisely the same view as that advanced in my letter to *Science*, as he directly contrasts the Atlantic and Pacific groups as to temperament, *culture*, and physical traits, and holds that there was very little communication between the people of the two regions. He says further of the Mayas, that "So far no relationship has been detected with any northern stock," but is inclined to look to the Mississippi Valley for their priscan home.

If Dr. Brinton still holds the view indicated in the above quotations, which are from his most recent works, I cannot understand the position he takes in his note to *Science*, as the one is in direct conflict with the other. I have not appealed to the numerous statements in his older works which differ from the views indicated in *Science*, as it appears that in the light of new data, and for reasons satisfactory to himself, he has, since 1887, entirely changed his views in reference to the origin of the people of the American continent and the course of migration so far as affected thereby. (See "Myths of the New World," 2d ed., pp. 34-35, and Address at Meeting of A. A. A. S., Salem, 1887.)

I may remark, in closing this communication, that it is very singular the numerous resemblances between the customs and arts of the West Coast Indians and Pacific Islanders, which descend even to unusual designs, have no special significance and are disposed of with the single word "illusory," while the resemblances in a few designs on shells and copper, though unusual, are sufficient to warrant us in looking to the valley of the Mississippi for the priscan home of the Mayas. Distance has, of course, to be taken into consideration in deciding as to the signification of these resemblances. What I assert is that the types of the West Coast, including Mexico and Central America, taken as a whole, have a more marked resemblance to the customs and art of what we may call the Pacific region (especially the islands) than to those of the Atlantic slope. This indicates, at least, a culture influence affecting the inhabitants of the Pacific Coast not felt on the Atlantic slope. And no theory which fails to give it more value than the mere coincident result of the "human psychical development" can abide the test of thorough examination.

CYRUS THOMAS.

The Lobatcheffsky Centenary

OCTOBER 22, 1893, a century will have passed since the birth of the famous Russian geometer, Lobatcheffsky. The world is just beginning to understand that, as mental ancestors of the modern scientific theory of man and the universe, only two take rank with him, Copernicus and Darwin. Until 1826 nothing had been published to overthrow the dogma that man has absolutely exact knowledge of "the space of experience." Lobatcheffsky showed that we can never know that any rectilineal triangle in "the space of experience" has its angle-sum exactly equal to a straight angle. As one result, geometrical axioms have disappeared for ever, and are replaced by *assumptions*. Thus he re-made not only mathematics, but kenlore. The Imperial University of Kasan is justly proud of its pupil, whom it speaks of as "encompassing it with an immortal splendor." It has organized a committee to raise a Lobatcheffsky fund to establish, in honor of his birthday, a prize, open to the world, for researches pertaining to non-Euclidean geometry. As a member of this committee, I will be